

The Essence of CEO Inside Debt

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Abstract

I examine the effect of CEO pension and deferred compensation, commonly known as CEO inside debt, on corporate cash holdings, as measured by the ratio of cash and marketable securities to net assets. Utilizing a sample of EXECUCOMP firms over the period of 2006 to 2008, I find a positive relation between the corporate cash holdings and CEO inside debt. I also find that cash increases have a more positive valuation effect for firms with high levels of CEO inside debt relative to those with low levels of CEO inside debt.

I Introduction

Agency theory (Jensen and Meckling, 1976) posits that agency conflicts between principals (shareholders and debtholders) and agent (managers) exist in modern corporations as the goals and desires of agents may not be consistent with those of principals. Managers, as a result, may not always use the firm's capital in a manner that maximizes shareholder's wealth and managers may engage in activities that reallocate wealth from debtholders to shareholders. Theoretically, managerial equity-based compensation aligns manager's interest with those of shareholders (Jensen and Meckling, 1976). Several studies examine the managerial incentive effects of equity-based compensation and provide empirical evidence on whether managerial stock and stock option ownership impact firm performance and particular corporate decisions and policies.² Nevertheless, excessive equity-based compensation may motivate managers to take more risk than debtholders prefer.

Pension and deferred compensation, inside debt, may mitigate agency conflicts between managers and debt holders (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Cassell, Huang, Sanchez, and Stuart, 2012). In the language of Jensen and Meckling (1976), "inside debt" represents a fixed obligation for the firm to make future payments to executives. Further, inside debt is typically an unsecured and unfunded liability for the firm. The unsecured and unfunded nature of inside debt exposes managers to the same default risks and insolvency treatment as outside creditors. This aligns managers with debt holders and may cause CEOs to manage their firms more conservatively (Jensen and Meckling, 1976; Edmans and Liu, 2011).

Corporate liquidity policy seems an ideal area to explore the link between CEO compensation incentives and shareholder-debtholder conflicts. Excessive equity-based compensation may motivate managers to hold smaller cash balances than debtholders desire. Inside debt compensation may motivate managers to manage firms conservatively by holding higher cash balances. I examine the effect of CEO inside debt on corporate cash holdings in this paper.

Agency conflicts between managers and shareholders occur when managers do not allocate corporate resources in ways that maximize shareholder wealth. For example, a primary agency conflict between managers and shareholders involves the overinvestment of free cash flows – managers may choose to invest in negative net present value projects. Prior literature in executive compensation suggests that equity-based compensation acts as a vehicle to resolve the conflicts of interests between managers and shareholders. For example, prior studies suggest that stock and

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² See for example, Core, Guay, and Larcker (2003) for a review of literature.

stock options encourage risk-averse CEOs to manage their firms in ways that benefit shareholders (Guay, 1999; Coles, Daniel, and Naveen, 2006; Low, 2009).

Agency conflicts between managers (or managers acting for shareholders) and debt holders occur when managers increase firm risk in ways that benefit shareholders at the expense of debt holders. Debt holders and shareholders have different payoff structures – debt holders are fixed claimants to firm assets while shareholders are residual claimants. Once debt is issued, shareholders may increase the value of their residual claims at the expense of debt holders. For instance, shareholders may increase the risk of the firm by changing investment or financial policies (asset substitution or risk shifting) in ways that reallocate wealth from debt holders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). Similarly, lower cash holdings may increase agency conflicts between managers and debtholders by increasing firm risk beyond what debtholders prefer.

While equity-based compensation mitigates agency conflicts between managers and shareholders, equity-based compensation may also exacerbate agency conflicts between managers and debt holders by motivating CEOs to increase risk beyond which debtholders prefer. Higher managerial inside debt serves to alleviate agency conflicts between managers and debt holders by aligning managers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. This suggests that CEO inside debt compensation may also be associated corporate liquidity policy.

I examine the effect of CEO inside debt compensation on corporate cash holdings, as measured by the ratio of cash and marketable securities to net assets using a sample of EXECUCOMP firms over the period of 2006 to 2008. Specifically, I test whether CEO inside debt is positively or negatively correlated with cash holdings. Higher CEO inside debt compensation alleviates agency conflicts between managers and debt holders by aligning managers with debt holders. For example, Cassell, Huang, Sanchez, and Stuart (2012) find that higher levels of CEO inside debt are associated with less risky investment and financial policies. CEOs with higher inside debt may prefer to invest in cash as cash holdings and less risky projects (Tong, 2010). Therefore, based on risk-aversion hypothesis, I posit a positive relation between CEO inside debt holdings and corporate cash holdings. Conversely, CEOs with debt-like compensation bear a lower cost of borrowing (Anantharaman, Fang, and Gong, 2010). This provides firms with easier access to external financing. Similarly, creditors anticipate that managers with high inside debt compensation will pursue less risky policies and require fewer covenants limiting their investing, financing, and payout decisions after debt issuance (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010). Thus, based on costly external finance hypothesis (Liu and Mauer, 2011), CEOs with higher inside debt may hold less cash as a hedge for future financing needs.

I begin by examining the effect of CEO inside debt holdings on firm cash holdings, measured as the ratio of cash plus marketable securities to net assets where net assets is equal to total assets minus cash plus marketable securities. The main explanatory variable of interest is CEO inside debt holdings. Following previous empirical studies on CEO inside debt holdings (Cassell et al., 2012), I use two measures as proxies for CEO inside debt holdings: 1) CEO to firm debt/equity ratio and 2) an indicator variable equal to one if the CEO to firm debt/equity ratio is greater than one. Utilizing a contemporaneous regression where cash and all independent variables including CEO inside debt holdings are measured at time t , I find a positive relation between CEO inside debt holdings and firm cash holdings. I next examine the relation between firm cash holdings

and lagged CEO inside debt holdings to mitigate the endogeneity problem and the positive relation between CEO inside debt holdings and firm cash holdings still hold.

As inside debt compensation encourages CEOs to take less risky investment policies, CEOs may forgo some positive net present value (NPV) projects if those projects are very risky (Myers, 1977). Therefore, firm value will decrease if cash increases for firms with higher CEO inside debt and if indeed CEOs forgo some positive net present value (NPV) projects. I examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with higher CEO inside debt. Following Pinkowitz, Stulz, and Williamson (2006), I use a modified version of the Fama and French (1998) valuation regression. I find that cash increases have a more positive valuation effect for firms with high levels of CEO inside debt relative to those with low levels of CEO inside debt.

This study makes several contributions to the literature. First, prior studies on executive compensation focus on equity-based (stocks and stock-options) and fixed (salary and bonus) compensation, while few studies examine debt-like compensation. This paper extends the literature which investigates the incentive effects of various components of CEO wealth, particularly CEO equity holdings (Guay, 1999; Rajgopal, and Shevlin, 2002; Coles, Daniel, and Naveen, 2006). Focusing on a different component of CEO compensation, inside debt, this study provides evidence of the effect CEO inside debt compensation on corporate cash holdings.

Second, this study contributes to a nascent literature on executive compensation which investigates the theoretical prediction that inside debt mitigates agency costs of debt by strengthening the alignment of CEO and debtholder incentives (Jensen and Meckling, 1976; Edmans and Liu, 2011). To date, extant research (Anantharaman, Fang, and Gong, 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011; Wei and Yermack, 2011; Francis and Yilmaz, 2012; He, 2011) has focused on market-based implications of CEO inside debt holdings (e.g. reduced cost of debt, fewer restrictive debt covenants, market reactions after initial disclosures of CEO inside debt compensation, financial reporting quality, etc.). In contrast, this study provides direct evidence of the effect of CEO inside debt on firm investment and financial policies by examining the relation between CEO inside debt compensation and corporate cash holdings. I extend Cassell et al., (2012), who look at the effect of CEO inside debt holdings on firm investment and financial policies, by investigating the effect of CEO inside debt on corporate cash holdings.³ Further, I extend Liu, Mauer, and Zhang (2012), who look at the effect of CEO inside debt on the marginal value of cash to shareholders, by utilizing a valuation regression, a total firm value approach which yields a net value of cash that combines the assessments of both shareholders and debtholders.

Finally, this study adds to the corporate cash holdings literature by documenting the effect of CEO inside debt compensation on corporate cash holdings. Prior literature documents several motives for firms to hold cash⁴: the transaction motive, the precautionary motive, the tax motive, and the agency motive. The literature on corporate cash holdings empirically examines agency theory by viewing cash holdings as a source of financing. My study contributes to the agency motive view of corporate cash holdings literature by focusing on the investment perspective of cash holdings and by exploring the link between CEO inside debt and corporate cash-holdings.

I organize the remainder of this paper as follows. I develop my hypotheses in Section 2. I provide an overview of sample selection and variables used in this study, methodology, and a

³ Cassell et al. (2012) find a positive relation between CEO inside debt and asset liquidity, measured by working capital. In my sample for this study, the correlation between working capital and firm cash holdings is not significant.

⁴ See Bates, Kahle, and Stulz, 2009 for details about why firms hold cash.

description of my sample in Section 3. Section 4 reports empirical results while Section 5 concludes.

II Hypothesis Development

CEO inside debt compensation mitigates agency costs of debt by aligning interests of CEOs with those of debtholders. Prior studies find that the firms whose CEOs are paid with inside debt holdings manage firms more conservatively as inside debt reduces CEOs' excessive risk-taking incentives. Since investment in cash lowers overall firm risk, an increase in CEO inside debt should increase cash holdings. This indicates a positive relation between CEO inside debt and the cash holdings of a firm.

H_{1a}: Cash holdings increase in CEO inside debt holdings.

Conversely, firms that encourage less risk-taking with high inside debt compensation may find it easier to raise external capital. Debtholders recognize the incentive effects of CEO inside debt holdings. Therefore, firms providing their CEOs with debt-like compensation bear a lower cost of borrowing. Hence, firms have better access to external financing market when CEO pay packages consist of a substantial amount of inside debt holdings. Debtholders also recognize the incentive effects of CEO inside debt holdings. Firms providing their CEOs with debt-like compensation bear fewer covenants limiting their investing, financing, and payout decisions after debt issuance. All these indicate a negative relation between CEO inside debt and cash holdings of a firm.

H_{1b}: Cash holdings decrease in CEO inside debt holdings.

As inside debt compensation encourages CEOs to take less risky investment policies, CEOs may forgo some positive net present value (NPV) projects if those projects are very risky (Myers, 1977). Therefore, firm value will decrease if cash increases for firms with higher CEO inside debt and if indeed CEOs forgo some positive net present value (NPV) projects. I examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with higher CEO inside debt.

H₂: Cash increases (decreases) have a more positive (negative) valuation effect for firms with higher CEO inside debt.

III Sample Selection and Data

Sample Selection

Data for this study comes from the followings sources: CEO compensation data from EXECUCOMP; corporate cash holdings and other accounting data from COMPUSTAT; stock price data from Center for Research in Securities Prices (CRSP), and governance variables from Investor Responsibility Research Center (IRRC).

The Securities and Exchange Commission (SEC) required all firms to expand executive compensation disclosure effective in 2006 fiscal year end. Therefore, 2006 marks the beginning of my sample period because this is the first year that EXECUCOMP reports CEO pension and deferred compensation information.

I use the Standard and Poor's EXECUCOMP database to create an initial sample of US firms from 2006 fiscal year to 2008 fiscal year. EXECUCOMP includes annual compensation data from proxy statements for the five highest paid executives for firms in the S&P 500, the S&P MidCap 400, and the S&P SmallCap 600. Following previous literature, I exclude all financial firms (SIC codes 6000-6999) as liquidity is hard to assess in these firms. I also exclude all utility firms (SIC codes 4900-4999) due to their unique regulatory environment. I then match this sample with COMPUSTAT, CRSP, and IRRC for accounting data, stock return data, and governance data respectively.

The initial sample of EXECUCOMP is matched with COMPUSTAT Annual Industrial file and Center for Research in Securities Prices (CRSP) databases from 2006 to 2008. I exclude all financial and utility firms (SIC code of 4900-4949 and 6000-6999), all leverage buyouts (LBO) firms (stock code 4 in CRSP), and all firms that incorporate abroad (incorporation code 99 in COMPUSTAT). I further limit my sample to ordinary common shares (share code 10 or 11 in CRSP). This excludes certificates, Americus trust components, closed-end funds, ADRs, shares of beneficial interest, units, and REITs from analysis. I delete any observations with missing values on CEO pension, deferred compensation, and CEO stock incentives. After deleting observations with missing values for these variables, I have a final matched sample of 1,859 firm-year observations from 2006 to 2008. My sample is comparable with recent studies on CEO inside debt holdings using the EXECUCOMP database over the period 2006 to 2008 (Cassell et al., 2012; Cen, 2011; Lee and Tang, 2011). I then match this final sample with Investor Responsibility Research Center (IRRC) for governance variables and sub-sample is smaller due to the data availability from IRRC.

My final sample does not include 453 firms which have zero debt or missing debt. This may raise a question if CEO inside debt compensation does not matter for all-equity firms. Sundaram and Yermack (2007) argue that the incentive impact of debt and equity holdings of CEOs depends on the capital structure of the firm. When a firm has debt and equity in its capital structure, then the CEO tends to shift risk from shareholders to debtholders if the CEO has only equity holdings in the firm. Compensating CEOs with pension and deferred compensation aligns interests of CEOs with that of debtholders which in turn, reduces agency costs of debt. CEO inside debt compensation impacts on decision-making by CEOs only when firm has debt in the capital structure. Therefore, CEO inside debt compensation does not matter for all-equity firms as risk shifting from shareholders to debtholders by CEOs does not happen for these firms.

Variable Descriptions

The primary variable is corporate cash holdings. The primary independent variable is CEO inside debt compensation. I also include several additional control variables that are related to both corporate cash holdings and CEO inside debt compensation. Appendix A provides detailed definition of the dependent and independent variables utilized in my analysis.

Corporate cash holdings

The primary dependent variable for this study is corporate cash holdings of a firm. Following prior literature (for example, Opler et al., 1999), I measure corporate cash holdings as the ratio of cash and marketable securities to net assets, where net assets are total assets minus cash and marketable securities. I also measure corporate cash holdings as cash and marketable securities to total assets and my results are similar if I use this alternative measure of corporate cash holdings.

CEO inside debt compensation

The primary explanatory variable is CEO inside debt holdings. Following prior literature on CEO inside debt holdings (for example, Cassell et al., 2012), I use two measures for CEO inside debt holdings: 1) the CEO to firm debt/equity ratio and 2) an indicator variable equal to 1 when the CEO to firm debt/ equity ratio is greater than one. The first measure, the CEO to firm debt/equity ratio, is calculated as the CEO's debt/equity ratio scaled by the firm's debt to equity ratio. The CEO's debt/ equity ratio is calculated as CEO inside debt holdings scaled by CEO equity holdings. CEO inside debt holdings are calculated as the sum of the present value of accumulated pension benefits and deferred compensation. CEO equity holdings are calculated as the value of both stock and stock options held by the CEO, where the value of stock is calculated by multiplying the number of shares held by the stock price at the firm's fiscal year end and the value of option is calculated by multiplying the total option delta (using the Black-Scholes (1973)) by the stock price at the firm's fiscal year end. Firm debt is the sum of current and long-term debt. Firm equity is the product of shares outstanding and the stock price at the firm's fiscal year end. The second measure is an indicator variable equal to 1 when the CEO to firm debt/ equity ratio is greater than 1 (i.e. the CEO is more levered than the firm), and zero otherwise.

Control variables: CEO compensation incentives

I include additional control variables to proxy for CEO compensation incentives that influence corporate cash holdings. Liu and Mauer (2011) find a positive relation between vega and cash holdings but no significant relation between delta and cash holdings. Following prior literature (for example, Guay, 1999; Core and Guay, 2002; Coles, Daniel, and Naveen, 2006), I measure CEO compensation incentives by the sensitivity of CEO wealth to stock return volatility (vega) and the sensitivity of CEO wealth to stock price (delta). Following Cassell et al. (2012), I construct the ratio of the vega to delta (CEO vega/delta ratio) to control for the effects of equity-based incentives on CEO risk-taking preferences and corporate cash holdings. I adjust the CEO vega/delta ratio by multiplying it by the ratio of total CEO equity holdings to CEO inside debt to capture the relative importance of the CEO's accumulated equity holdings.⁵

Governance variables

Following prior literature (for example, Dittmar and Mahrt-Smith, 2007), I control for the impact of corporate governance on cash holdings. I measure the degree of managerial entrenchment due to takeover protection using the Gompers, Ishii, and Metrick (2003) (GIM INDEX) index. GIM INDEX is the number of antitakeover provisions in a firm's charter and the index varies from zero to 24. As the most recent data on antitakeover amendments is 2006, I use the G-Index of 2006 for my sample firms from 2006 to 2008.

Firm-specific control variables

Following prior literature on corporate cash holdings (Opler et al., 1999; Bates, Kahle, and Stulz, 2009), I also include several additional control variables to proxy for firm specific factors that may motivate and influence corporate cash holdings. These control variables are motivated by the transaction and precautionary explanations for corporate cash holdings. Firm size is related with the transaction cost motive for cash holdings (Opler et al, 1999). Firm size is calculated as the logarithm of total assets. The precautionary motives suggest that firms with better investment opportunities hold more cash because adverse shocks and financial distress are more costly for

⁵ If CEO equity holdings are large (small), the effect of the CEO vega/delta ratio is likely to be large (small).

them (Opler et al, 1999). I use market-to-book asset ratio, computed as the book value of net assets minus the book value of equity plus the market value of equity, all divided by the book value of net assets, to indicate investment opportunities. Firms with higher cash flow accumulate more cash, all else equal (Bates et al., 2009). I use Cash flow/net assets which is computed as the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets. I include NWC/net assets, computed as the net working capital-to-net assets ratio, as net working capital consists of assets that substitute for cash. Capital expenditures can affect corporate cash holdings either from the tradeoff theory or from the financing hierarchy theory (Opler et al., 1999). I measure capital expenditures as Capex/net assets which is computed as the ratio of capital expenditures to the book value of net assets. I include leverage as firms will use cash to reduce leverage if debt is sufficiently constraining. Leverage is measured as sum of long-term debt and debt in current liabilities divided by the book value of net assets. Bates et al (2009) argue that firms that pay dividends are likely to be less risky and have greater access to capital markets and so, they tend to hold less cash. I include a dividend dummy which is a dummy variable equal to one in years in which a firm pays a common dividend and is zero otherwise to proxy for dividends. I employ R&D/sales, the ratio of research and development expense to sales, to measure growth opportunities. I use acquisition activity, the ratio of expenditures on acquisitions to the book value of net assets, as Bates et al. (2009) argue that acquisitions and capital expenditures would seem to be substitutes.

Descriptive Statistics

Table 1 presents summary statistics for the full sample. All continuous variables are winsorized at upper and lower 1% of the sample distribution to address potential problems associated with extreme observations. Panel A of Table 1.1 reports descriptive statistics. The mean (median) cash is 0.1467 (0.0699). I find that the mean (median) CEO debt/equity ratio is 0.280 (0.078). This suggests that CEO equity holdings are larger than CEO inside debt holdings for the majority of my sample firms. However, the average CEO holds more than \$5 million in inside debt, suggesting that inside debt holdings are nontrivial to my sample CEOs. The CEO to firm debt/equity ratio shows a similar distribution with mean (median) values of 0.684 (0.296). The mean (median) CEO to firm debt/equity ratio >1 is 0.2399 (0.0000) indicating that CEO's debt-to-equity ratio is less than firm's debt-to-equity ratio for the majority of my sample firms.

Panel B of Table 1 reports Pearson correlations for my variables of interest and my primary dependent variables. Interestingly, I find a negative and significant relation between firm cash holdings and CEO inside debt holdings. I find a positive but insignificant relation between CEO to firm debt/equity ratio and firm cash holdings while I find a negative but insignificant relation between CEO to firm debt/equity ratio >1 and firm cash holdings.

Methodology

I examine the effect of CEO inside debt compensation on corporate cash holdings in this section. I begin by employing multivariate regressions of cash holdings on CEO inside debt compensation.

Table 1: Descriptive Statistics and Correlations

This table presents descriptive statistics and correlations. Variables include the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash), the sum of the present value of accumulated pension benefits and deferred compensation (CEO inside debt holdings), the natural log of 1 plus the ratio of CEO's debt-to-equity ratio (CEO to firm debt/equity ratio), a dummy variable that equals one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio > 1), the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), the number of years since the first year that the firm is reported in Compustat (Firm age), the number of years the executive has served as CEO (CEO tenure), a dummy variable that equals to one if CEO is also the chairman of the board (Duality), the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and varies from zero to 24 (GIM Index). Detailed definitions of all variables are reported in Appendix A. Data are obtained from COMPUSTAT, CRSP, EXECUCOMP, and IRRC and consist of 1,859 firm-year observations from 2006 to 2008. Panel A reports descriptive statistics. Panel B reports pairwise correlation of primary variables. Correlations significant at 5% or better are marked with stars.

Panel A: Summary Statistics

	N	Mean	Std.Dev	P25	Median	P75
Cash holdings	1859	0.1467	0.2318	0.0253	0.0699	0.1751
CEO inside debt holdings (\$ Millions)	1859	5.881	11.923	0.035	1.483	6.733
CEO debt/equity ratio (\$ Millions)	1859	0.280	0.552	0.0010	0.078	0.3158
CEO to firm debt/equity ratio	1859	0.684	1.071	0.005	0.296	0.956
CEO to firm debt/equity ratio >1	1859	0.2399	0.4271	0.0000	0.0000	0.0000
Firm size	1859	7.686	1.452	6.649	7.582	8.651
Dividend dummy	1859	0.576	0.494	0.000	1.000	1.000
Market-to-book ratio	1859	2.197	2.131	1.187	1.593	2.219
Cash flow/Net assets	1859	0.092	0.147	0.057	0.096	0.143
NWC/Net assets	1859	0.078	0.198	-0.019	0.088	0.189
Capex/Net assets	1859	0.0636	0.0652	0.0246	0.0431	0.0771
Leverage	1859	0.2099	0.1446	0.1022	0.1978	0.2989
R&D/Sales	1859	0.051	0.103	0.000	0.002	0.049
Acquisition Activity	1859	0.034	0.077	0.000	0.001	0.302
GIM Index	1144	9.120	2.651	7.000	9.000	11.000
CEO Vega/Delta ratio	1859	0.3135	0.3659	0.0714	0.2098	0.4763

Panel B: Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	
1 Cash	1.00													
2 CEO inside debt holdings	-0.1165***	1.00												
3 CEO to firm debt/equity ratio	0.0084	0.3089***	1.00											
4 CEO to firm debt/equity ratio>1	-0.0305	0.3633***	0.7222***	1.00										
5 Firm Size	-0.2986***	0.4428***	0.0567**	0.1014***	1.00									
6 Market-to-book ratio	0.5437***	-0.2217**	0.0473**	0.0359**	-0.1008***	1.00								
7 Cash flow/Net Assets	-0.1489***	-0.0491***	0.0857***	0.0934**	-0.0057**	-0.0038**	1.00							
8 NWC/Net Assets	-0.2298***	0.0513***	0.1162***	0.1073***	-0.3215**	-0.0072**	-0.0814***	1.00						
9 CAPEX/Net Assets	0.0944***	-0.1483***	-0.0504**	-0.0527**	-0.4555***	0.0121	0.0052	-0.3714***	1.00					
10 Leverage	-0.1892***	0.0267	-0.3303***	-0.2792***	0.1707***	-0.3348***	-0.1769***	-0.1342***	-0.1191***	1.00				
11 Dividend Dummy	-0.2152***	0.2785***	0.2069***	0.2341***	0.3555***	0.0436***	-0.1310***	-0.0827***	-0.1803***	-0.0013	1.00			
12 R&D/Sales	0.4315***	-0.1155***	-0.0552**	-0.0828***	-0.3805***	0.3032***	0.1876***	0.0418***	0.2160***	-0.1124***	-0.2332***	1.00		
13 Acquisition Activity	-0.0378***	-0.0714***	-0.0698***	-0.0757***	0.0341***	0.0067**	0.0547***	-0.2851***	0.0713***	-0.0401***	-0.0637***	0.1862**	1.00	
14 GIM Index	-0.1901***	0.1823***	0.1056***	0.0098***	0.1634***	-0.1183***	0.0421***	-0.0513***	-0.0312***	0.0097***	0.1625***	-	0.1014***	0.002*

Effect of CEO Inside Debt Holdings on Cash Holdings

To examine the effect of CEO inside debt compensation on corporate cash holdings, I regress cash holdings on CEO inside debt compensation and control for industry (2-digit SIC code dummies) and year (year dummies) fixed effect. Following Liu and Mauer (2011), I first examine the contemporaneous relation between cash holdings and CEO compensation incentives. The model I test is as shown below:

$$CASH_{it} = \alpha + \beta_1 (CEO \text{ inside debt compensation})_{it} + \beta_k (controls)_{it} + \beta_i \sum(2 - \text{digit SIC dummy variables})_i + \beta_y \sum(\text{year dummy variables})_t + \varepsilon_{it} \quad (1)$$

Next, following prior studies on corporate cash holdings (Harford, Mansi, and Maxwell, 2008 and Liu and Mauer, 2011), I examine the relation between cash holdings and lagged CEO compensation incentives to control for potential endogeneity of compensation incentives. The model I test is as shown below:

$$CASH_{it} = \alpha + \beta_1 * (CEO \text{ inside debt compensation})_{i, t-1} + \beta_k (controls)_{i,t-1} + \beta_i \sum(2 - \text{digit SIC dummy variables})_i + \beta_y \sum(\text{year dummy variables})_t + \varepsilon_{it} \quad (2)$$

After examining the effect of CEO inside debt holdings on firm cash holdings, I next examine whether cash increases (decreases) have a more positive valuation effect for firms with higher CEO to firm debt/equity ratio. I employ the Fama and French (1998) valuation regression. This regression has been used in many studies examining valuation effects and is well suited for my purpose as it accounts for cross-section variations in firm value. This total firm value regression approach has been used in many studies examining valuation effect.

Pinkowitz and Williamson (2005) use this model to analyze the determinants of the value of cash for domestic firms. Pinkowitz, Stulz, and Williamson (2003) use this model to investigate the valuation effect of cash and dividends for firms in countries with different level of investor protection. Dittmar and Mahrt-Smith (2007) use this model to show that cash is worth less when agency problems between insiders and outsiders are greater. Brockman and Unlu (2009) use this model to test whether dividend reductions (increases) are value increasing (decreasing) for firms in countries with poor creditor rights. Following Pinkowitz, Stulz, and Williamson (2006), I use the modified version of the Fama and French (1998) valuation regression by replacing the two-year change in value of variables by one-year change in value of variables. Prior studies in corporate cash holdings use this valuation regression and it is a total firm value approach which yields a net value of cash that combines the assessments of both shareholders and debtholders.

The basic regression specification is as follows:

$$V_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dA_{i,t} + \beta_5 dA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} + \beta_{12} C_{i,t} + \beta_{13} dC_{i,t} + \beta_{14} dC_{i,t+1} + \beta_{15} dV_{i,t+1} + \varepsilon_{i,t} \quad (3)$$

In the above equation (3), all variables are scaled by total assets to control for heteroskedasticity (see Pinkowitz, Stulz, and Williamson, 2003; and Brockman and Unlu, 2009). X_t is the level of variable X in fiscal year t scaled by total assets in year t. dX_t is the change in variable X from year t-1 to year t scaled by total assets in year t $((X_t - X_{t-1})/A_t)$. dX_{t+1} is the

change in variable X from year t to year $t+1$ scaled by total assets in year t ($(X_{t+1} - X_t)/A_t$). Firm value is measured by the market value of the firm, which is calculated as the sum of market value of equity and total liabilities at fiscal year end. The independent variables include earnings (E), total assets (A), research and development expenditures (RD), interest expense (I), cash plus marketable securities ($Cash$), and total value of the firm value for year $t+1$ (V_{t+1}). Earnings are calculated as earnings before extraordinary items, plus interest expense, plus income statement deferred taxes and investment tax credit (if available). A is the book value of total assets. RD is R&D expenditures and is set to zero when missing. I is the interest expense. V is firm's common stock price multiply shares outstanding at the end of fiscal year, plus preferred stock, plus total book liabilities, minus balance sheet deferred taxes and investment tax credit (if available), where preferred stock is taken to be, in order and as available, redemption value, liquidating value, or par value. Notice that this model includes next-period variables to absorb changes in expectations. The primary variable of interest in my study is the contemporaneous relation between firm value and cash plus marketable securities ($Cash_{i,t}$). This directly measures the valuation effect of current cash plus marketable securities on firm.

IV Empirical Results

I examine the effect of CEO inside debt compensation on firm cash holdings in this section. I begin by employing multivariate regressions of firm cash holdings on CEO inside debt compensation. I then report results of a Fama and French (1998) valuation regression to examine whether cash increases (decreases) have a more positive (negative) valuation effect for firms with higher CEO to firm debt/equity ratio.

Effect of CEO inside debt holdings on firm cash holdings

I begin by examining the effect of CEO inside debt compensation on firm cash holdings. Following Liu and Mauer (2011), I first examine the contemporaneous relation between cash holdings and CEO compensation incentives, where firm cash holdings and all independent variables are measured at time t . Table 2 reports the results of multivariate regressions with controls for industry and year fixed effect. Models 1 and 2 report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models 3 and 4 include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio >1 .

The estimated coefficients on CEO to firm debt/equity ratio are positive and significant in models 1 and 2. This supports H_{1a} , which predicts that cash holdings are increasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models 3 and 4. The estimated coefficients on CEO to firm debt/equity >1 are positive and significant. I continue to find support for H_{1a} . The firm cash holdings are increasing in CEO inside debt holdings.

Table 2: Contemporaneous Regressions of Cash Holdings on CEO Inside Debt Holdings

This table reports results of the effect of CEO inside debt holdings on cash holdings in contemporaneous specification where cash and all independent variables are measured at time t . All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio > 1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24, and CEO vega/delta ratio. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models 1 and 2 report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while models 3 and 4 report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio > 1). The t -statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
CEO to firm debt/equity ratio	0.0057*** (3.88)	0.0035*** (2.47)		
CEO to firm debt/equity ratio > 1			0.037*** (4.80)	0.029*** (4.97)
Firm Size		-0.071*** (-13.11)		-0.073*** (-8.45)
Market-to-book ratio		0.073*** (13.44)		0.075*** (15.31)
Cash flow/Net Assets		-0.027 (-0.37)		-0.023 (-0.45)
NWC/Net Assets		-0.334*** (-6.18)		-0.325*** (-5.79)
Capex/Net Assets		-0.103 (-0.87)		-0.115 (-0.75)
Leverage		-0.017 (-0.48)		-0.023 (-0.57)
R&D/Sales		1.357*** (11.67)		1.413*** (10.54)
Dividend Dummy		-0.014		-0.017

		(-1.38)		(-1.61)
Acquisition Activity		-0.319***		-0.327***
		(-6.67)		(-6.98)
GIM Index		-0.004*		-0.005*
		(-2.97)		(-1.53)
CEO Vega/Delta Ratio		0.0013**		0.0015**
		(2.60)		(2.97)
Industry and year fixed effect	YES	YES	YES	YES
N	1859	1144	1859	1144
Adj. R ²	0.49	0.51	0.50	0.52

While studying the effect of corporate governance on firm cash holdings, Harford, Mansi, and Maxwell (2008) lag their governance variables and argue that lagging helps control for potential endogeneity of governance. Liu and Mauer (2011) report the results of the relation between cash holdings and lagged CEO compensation incentives. To control for potential endogeneity of compensation incentives, I next examine the effect of lagged CEO inside debt compensation on firm cash holdings. Table 3 reports the results of multivariate regressions with controls for industry and year fixed effect. Models 1 and 2 report results for the full sample where the main explanatory variable is the first measure of CEO inside debt holdings, CEO to firm debt/equity ratio. Models 3 and 4 include the alternative measure of CEO inside debt holdings, CEO to firm debt/equity ratio > 1.

The estimated coefficients on CEO to firm debt/equity ratio are positive and significant in models 1 and 2. This supports H_{1a} , which predicts that cash holdings are increasing in CEO inside debt holdings. My conclusions are unchanged using an alternative proxy for inside debt in Models 3 and 4. The estimated coefficients on CEO to firm debt/equity > 1 are positive and significant. I continue to find support for H_{1a} . The firm cash holdings are increasing in CEO inside debt holdings.

Table 3: Lagged Regressions of Cash Holdings on CEO Inside Debt Holdings

This table reports results of the effect of CEO inside debt holdings on cash holdings in lagged specification where cash is measured at time $t+1$ and all independent variables are measured at time t . All models control for industry and year fixed effect, where industry is defined based on Fama and French 49 industry classification. The dependent variable is the ratio of cash plus marketable securities to net assets, where net assets are total assets minus cash and marketable securities (Cash). The two main independent variables are two measures to proxy CEO inside debt holdings: CEO to firm debt/equity ratio, and a dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise (CEO to firm debt/equity ratio > 1). Control variables are the ratio of CEO vega to the delta (CEO Vega/Delta Ratio), the natural logarithm of net assets (Firm Size), the ratio of the book value of net assets minus the book value of equity plus the market value of equity to the book value of net assets (Market-to-book), the ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets (Cash flow/assets), the ratio of net working capital to net assets (NWC/assets), the ratio of capital expenditures to the book value of net assets (Capex/assets), the sum of long-term debt and debt in current liabilities divided by the book value of net assets (Leverage), a dummy variable that equals one if regular cash dividends on common stock is positive in a given fiscal year (Dividend payout dummy), the ratio of research and development expense to sales (R&D/sales), the ratio of expenditures on acquisitions to the book value of net assets (Acquisition activity), GIM Index, the number of antitakeover provisions in the

firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and the index varies from zero to 24, and CEO vega/delta ratio. Detailed definitions of all variables are reported in Appendix A. Sample period is 2006 - 2008. Models 1 and 2 report results where the main explanatory variable is the first measure of CEO inside debt holdings (CEO to firm debt/equity ratio) while models 3 and 4 report results where the main explanatory variable is the second measure of CEO inside debt holdings (CEO to firm debt/equity ratio > 1). The *t*-statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

	(1)	(2)	(3)	(4)
CEO to firm debt/equity ratio	0.0062*** (3.39)	0.0049*** (2.84)		
CEO to firm debt/equity ratio > 1			0.047*** (4.79)	0.027*** (3.47)
Firm Size		-0.073*** (-12.58)		-0.076*** (-10.66)
Market-to-book ratio		0.078*** (9.63)		0.081*** (11.78)
Cash flow/Net Assets		-0.057 (-1.05)		-0.075 (-1.59)
NWC/Net Assets		-0.461*** (-8.57)		-0.491*** (-7.42)
Capex/Net Assets		-0.138 (-0.92)		-0.157 (-1.56)
Leverage		-0.105 (-0.98)		-0.113 (-0.81)
R&D/Sales		1.973*** (7.67)		1.995*** (8.13)
Dividend Dummy		-0.023 (-1.85)		-0.027 (-1.96)
GIM Index		-0.001* (-3.11)		-0.003* (-2.74)
CEO Vega/Delta Ratio		0.0009** (1.89)		0.0013** (2.32)
Industry and year fixed effect	YES	YES	YES	YES
N	1832	1110	1832	1110
Adj. R ²	0.34	0.37	0.39	0.42

Effect of Cash Increases (Decreases) on Valuation Effect for Firms with Higher CEO to firm debt/equity ratio

Table 4 reports the results using a modified version of the Fama and French (1998) valuation regression model. I allow the coefficient estimates and intercept to vary with inside debt in order to estimate how cash plus marketable securities have a different valuation effect for firms with different levels of inside debt. More specifically, in each fiscal year, I create a dummy variable with a value of one for firms with a CEO to firm debt/equity ratio above median and zero

otherwise. This dummy variable is further interacted with all the independent variables as well as the constant. Therefore, the coefficient estimates on the interaction term are the additional valuation effect of cash for firms with relative inside debt ratio above median. Cash increases should generate more value for firms with higher relative inside debt ratio. Following Fama and French (1998), I estimate the equation using the Fama-MacBeth (1973) methodology. Model 1 does not include industry fixed effect while Model 2 includes industry fixed effect.

Table 4: CEO inside debt compensation and cash valuations

This table presents the regression results of cash valuation effect for firms with different level of CEO to firm debt/equity ratio using Fama and MacBeth (1973) methodology. Sample period is 2006-2008. Due to data limitation on Compustat, sample size is reduced to 1,758 firm-year observations. Model (1) does not include industry fixed effect. Model (2) includes industry fixed effect. Industry is defined based on Fama and French 49 industry classification. X_t is the level of variable X in fiscal year t scaled by total assets in year t . dX_t is the change in variable X from year $t-1$ to year t scaled by total assets in year t ($(X_t - X_{t-1})/A_t$). dX_{t+1} is the change in variable X from year t to year $t+1$ scaled by total assets in year t ($(X_{t+1} - X_t)/A_t$). The independent variables include earnings (E), total assets (A), research and development expenditures (RD), interest expense (I), cash plus marketable securities (Cash), and total value of the firm value for year $t+1$ (V_{t+1}). Earnings is calculated as earnings before extraordinary items, plus interest expense, plus income statement deferred taxes and investment tax credit (if available). A is the book value of total assets. RD is $R\&D$ expenditures and is set to zero when missing. I is the interest expense. V is the market value of the firm calculated by multiplying firm's common stock price by shares outstanding at the end of fiscal year, plus preferred stock, plus total book liabilities, minus balance sheet deferred taxes and investment tax credit (if available), where preferred stock is taken to be, in order and as available, redemption value, liquidating value, or par value. The t -statistics are reported in parentheses. Superscripts *, ** and *** indicate levels of significance of 10%, 5%, and 1%, respectively.

	(1)		T- statistics of difference	(2)		T- statistics of difference
	Low inside debt	High inside debt		Low inside debt	High inside debt	
E_t	5.0328** (7.21)	6.5625** (8.01)	0.253	4.8523** (5.87)	6.2957** (6.24)	0.283
dE_t	-1.0561*** (-17.54)	-1.428*** (-18.22)	0.697	-0.9400** (-4.64)	-1.4806** (-4.90)	0.583
dE_{t+1}	2.5550** (8.60)	2.895** (8.65)	0.519	2.6888** (6.26)	2.8205** (5.94)	0.777
dA_t	-0.1585 (-1.13)	-0.1439 (-1.14)	0.967	-0.1280 (-1.27)	-0.1123 (-1.65)	0.953
dA_{t+1}	0.4055 (1.56)	0.3157 (1.57)	0.797	0.4908 (1.88)	0.3420 (2.98)	0.650
RD_t	1.9325 (1.00)	2.2052** (6.20)	0.065	1.2776 (1.00)	1.4465* (4.92)	0.079
dRD_t	-0.9988 (-0.73)	-1.003 (-0.80)	0.998	-0.3222 (-0.18)	0.675 (1.90)	0.771

dRD_{t+1}	0.785* (5.20)	1.232** (8.65)	0.035	0.623* (4.96)	0.895** (5.63)	0.491
I_t	-9.4114** (-5.26)	-6.5566** (-6.50)	0.100	-7.9970** (-6.67)	-3.6936** (-6.34)	0.038
dI_t	9.4082 (1.70)	4.5406 (2.03)	0.537	7.7299 (1.70)	7.2246 (2.97)	0.509
dI_{t+1}	5.0291** (6.19)	3.2808** (5.99)	0.831	3.6533* (3.43)	3.6543* (3.98)	1.000
$Cash_t$	2.9417 (2.55)	5.1059** (5.20)	0.083	3.2029** (4.42)	7.8561** (5.23)	0.081
$dCash_t$	0.3024 (1.91)	-0.088 (-2.05)	0.673	0.1604 (1.89)	-0.2840 (2.03)	0.667
$dCash_{t+1}$	1.7248 (1.09)	4.2017* (5.60)	0.062	1.8534 (1.67)	6.5712** (4.67)	0.042
dV_{t+1}	-0.2623 (-1.02)	-0.4333 (-3.05)	0.135	-0.2739 (-1.09)	-0.4593 (-2.10)	0.150
Constant	1.3694** (5.85)			1.2311*** (48.56)		
N	1758.0000			1758.0000		
r2	0.6281			0.5583		

The estimated coefficient on $Cash_t$ for high inside debt firms in Model 1 is positive and significant. While the estimated coefficient on $Cash_t$ for low inside debt firms is also positive in Model 1, the positive valuation effect is significantly greater for high inside debt firms relative to low inside debt firms. My results are similar in Model 2 which includes industry fixed effects. It is important to note that t-statistics of difference is insignificant. An insignificant t-test result means that the difference between the means of the two groups is not statistically significant, which suggests that any observed difference could have arisen due to random chance or sampling error. Overall, results from Table 4 support H_2 and suggest that cash changes have a more positive valuation effect for firms with higher level of inside debt than firms with a lower level of inside debt.

V Conclusion

In summary, this study provides compelling evidence that CEO inside debt compensation plays a crucial role in shaping corporate cash holdings. By aligning the interests of executives with those of debtholders, this form of compensation mitigates agency conflicts and promotes a more conservative approach to financial management. The positive relationship identified between CEO inside debt and cash reserves suggests that executives with greater inside debt are more inclined to prioritize liquidity. This cautious strategy not only enhances the firm's financial stability but also reflects a risk-averse investment philosophy.

Furthermore, the findings indicate that increases in cash holdings have a more favorable impact on firm valuation in the context of higher CEO inside debt. This reinforces the notion that investors value liquidity when it is managed under conservative oversight. Overall, the results emphasize the importance of compensation structures in corporate governance, highlighting how

well-designed executive pay can influence both managerial behavior and market perceptions. These insights emphasize the importance of executive compensation design in shaping corporate financial strategies and indicate that aligning managerial incentives with the interests of debt holders can lead to improved firm performance and investor confidence.

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Appendix A: Definition of Variables

Dependent Variable	Definition and Data Source
Cash holdings	The ratio of cash and marketable securities to net assets: $A1/(A6 - A1)$ Data source: Compustat
Independent Variable	Definition and Data Source
CEO to firm debt/equity ratio	The natural log of 1 plus the ratio of the CEO's debt-to-equity ratio to the firm's debt-to-equity ratio. CEO's inside is calculated as sum of the present value of accumulated pension benefits and deferred compensation; CEO equity is calculated as the value of both stock and option held by the CEO, where the value of stock is calculated as the number of shares multiply by the stock price at the end of firm's fiscal year, and the value of option is calculated as the total option delta (calculated based on Black-Scholes (1973) option formula) multiply by the stock price at the end of firm's fiscal year; firm's debt is the sum of current and long-term debt; firm's equity is the product of shares outstanding and the stock price at the end of firm's fiscal year. Data source: Execucomp, CRSP, Compustat
CEO to firm debt/equity ratio > 1	A dummy variable with a value of one if CEO to firm debt/equity ratio is larger than one and zero otherwise
CEO inside debt holdings	The sum of the present value of accumulated pension benefits and deferred compensation Data source: Execucomp
Firm size	The logarithm of total assets Data source: Compustat
Dividend payout dummy	A dummy variable that equals one if the regular cash dividends on common stock is positive in a given fiscal year, and zero otherwise. Data source: Compustat
R&D/Sales	The ratio of research and development expense to sales Data source: Compustat
GIM Index	The number of antitakeover provisions in the firm's charter as reported by the Investor Responsibility Research Center (IRRC) in 2006 and it varies from 0 to 24. Data source: Risk Metrics (IRRC)
NWC/Net Assets	The ratio of net working capital to net assets Data source: Compustat
Cash flow/Net Assets	The ratio of earnings after interest, dividends and taxes but before depreciation divided by the book value of net assets Data source: Compustat
CAPEX/Net Assets	The ratio of capital expenditures to net assets Data source: Compustat
Market-to-book ratio	The book value of net assets minus the book value of equity plus the market value of equity, all divided by the book value of net assets Data source: Compustat

Leverage	The ratio of sum of long-term debt and debt in current liabilities to net assets Data source: Compustat
CEO vega/delta ratio	The ratio of the vega (the sensitivity of the value of CEO's accumulated equity-based compensation to a one percent change in the volatility of stock prices) to the delta (the sensitivity of the value of the CEO's accumulated equity-based compensation to a one percent change in the stock price). I adjust this CEO vega/delta ration by multiplying it by the ratio of CEO equity-holdings to CEO inside debt holdings so that this measure captures the relative importance of the CEO's equity holdings. Data source: Execucomp, CRSP, Compustat
Acquisition activity	The ratio of expenditures on acquisitions to net assets Data source: Compustat

Appendix B: Literature Review

Corporate Cash Holdings and Agency Costs

Corporate liquidity policy is regarded as one of the firm's most important decisions. This is especially true as prior studies document that US firms hold a large portion of their assets in the form of cash. For example, Bates, Kahle and Stulz (2009) find that the average cash-to-assets ratio more than doubles from 10.5% in 1980 to 23.2% in 2006. Based on Bates, Kahle, and Stulz (2009), there are four main motives for firms to hold cash: the *transaction* motive (Baumol, 1952; Miller and Orr, 1966; Mulligan, 1977)⁶; the *precautionary* motive (Opler, Pinkowitz, Stulz, and Williamson, 1999)⁷; the *tax* motive (Foley, Hartzell, Titman, and Twite, 2007)⁸; and the *agency* motive (Dittmar, Mahrt-Smith, and Servaes, 2003; Dittmar, and Mahrt-Smith, 2007; Pinkowitz, Stulz, and Williamson, 2006; Harford, Mansi, and Maxwell, 2008).

This study focuses primarily on the agency motive of cash holdings. Prior literature focuses on whether the agency theory explains the level of corporate cash holdings (Opler et al., 1999; Dittmar, Mahrt-Smith and Servaes, 2003; Dittmar, Mahrt-Smith, 2007; Pinkowitz, Stulz, and Williamson, 2006), and whether corporate cash holdings affect firm value through the agency problem (Harford, 1999). While Opler et al. (1999) do not find support for the agency motive using managerial ownership as the combined measure for the free cash flow hypothesis and risk-reduction hypothesis, other researchers find support. Dittmar et al. (2003) find that corporate cash holdings in different countries are affected by the degree of shareholder protection from law and firms hold more cash in countries with greater agency problems. Consistent with free cash flow hypothesis, Harford (1999) finds that cash-rich firms are more likely to make value-decreasing acquisitions. Dittmar, Mahrt-Smith (2007) and Pinkowitz, Stulz, and Williamson (2006) find that cash is worth less when agency problems between insiders and outside shareholders are greater. Harford, Mansi, and Maxwell (2008) find that entrenched managers are more likely to build excess cash balances but spend excess cash quickly.

The agency theory explanation for cash holdings includes both the free-cash flow hypothesis and risk-reduction hypothesis. According to the free-cash flow hypothesis, cash is viewed as a source of financing available to the manager who serves his own interest at the cost of shareholders' wealth (Jensen, 1986; Harford, 1999). Risk-reduction is a typical agency problem originating from different risk preferences between managers and shareholders. The risk-reduction hypothesis posits that cash holdings are risk-free investments and so, a risk-averse and self-interested manager allocates higher corporate cash holdings to reduce firm risk. For instance, Amihud and Lev (1981) argue that a risk-averse manager may select lower NPV but less risky investment projects, which can reduce firm value.

As noted above, previous studies on corporate cash holdings primarily focus on the free-cash flow hypothesis. However, there are limited studies which explore the risk-reduction hypothesis in the context of corporate cash holdings. Consistent with risk-related agency theory, Tong (2010) finds that firms with higher CEO risk incentives have less cash holdings using a sample of 1,768 firms from 1993 to 2000. Conversely, Liu and Mauer (2011) find a positive

⁶ Transaction motive focuses on the need to conserve on the cost of converting non-financial assets into cash and posits that firms that are more likely to incur higher transaction costs are expected to maintain higher cash balances.

⁷ The precautionary motive posits that firms hold cash to meet the needs of the firms when it faces unanticipated contingencies and when access to capital markets is costly.

⁸ The tax motive predicts that US firms that would incur tax consequences related with repatriating foreign earnings hold higher cash balances.

relation between CEO risk-taking (vega) incentives and cash holdings utilizing a sample of EXECUCOMP firms from 1992 to 2006. Liu and Mauer (2011) measure the marginal value of cash to shareholders and find that high CEO vega is associated with a lower value of cash. This empirical evidence is also consistent with the costly contracting hypothesis, which posits that debtholders expect greater risk-taking in high vega firms and so, require greater liquidity.

Inside Debt Compensation as a Means to Reduce Agency Costs of Debt

Many CEOs in the US hold significant amounts of pay in the form of defined benefit pension plans and deferred compensation (Sundaram and Yermack, 2007; Wei and Yermack, 2011). These forms of executive compensation are defined as inside debt (in the language of Jensen and Meckling (1976)) as this compensation represents fixed obligation for the firm to make future payments to corporate insiders. Inside debt compensation are unsecured and unfunded, exposing CEOs to the same default risks and insolvency treatment as outside creditors. Therefore, CEO inside debt compensation can be used as a vehicle to mitigate the agency costs of debt (Sundaram and Yermack, 2007; Edmans and Liu, 2011; Wei and Yermack, 2011; Lee and Tang, 2011; Cassell et al., 2012).

Agency costs of debt occur when managers vary the firm's investment policy, payout policy, or capital structure in ways that reallocate wealth from debtholders to stockholders, generally through some increase in the overall risk of the firm (Jensen and Meckling, 1976; Dewatripont and Tirole, 1994). To alleviate the agency costs of debt, Jensen and Meckling (1976) recommend implementing an optimal incentive structure under which the CEO's personal holdings of the firm's debt and equity ratio is similar to the firm's overall capital structure. Based on agency theory, studies on CEO inside debt compensation find that CEOs with higher inside debt holdings prefer less risky investment and financial policies (Cassell et al., 2012). Sundaram and Yermack (2007) find that as the value of a CEO's pension increases relative to the value of her equity holdings, risk taking, as measured by distance-to-default declines. Wei and Yermack (2011) examine stockholder and bondholder reactions to firms' initial reports of their CEOs' inside debt positions in early 2007 when new SEC disclosure rules took effect. The authors find that bond prices rise, equity prices fall, and the volatility of both securities drops upon disclosures by firms where the CEO has a sizeable defined benefit pension or deferred compensation. This suggests that inside debt may reduce firm risk and transfer wealth from equity toward debt. This is also consistent with the idea that investors anticipate less risk taking by managers with higher levels of inside debt.

Several recent studies also find a negative relation between CEO inside debt holdings and the cost of debt (Anantharaman et al., 2010; Chen, Dou, and Wang, 2010; Wang, Xie, and Xin, 2011). When compensation packages of CEOs consist of both inside debt compensation and equity-based compensation, CEO incentives vary with the relative importance of debt versus equity based compensation in the pay structure (inside leverage of the CEO). The higher a CEO's inside leverage relative to firm leverage (the CEOs' relative leverage), the more closely the CEO's incentives are aligned with debtholders vis-à-vis shareholders and the lesser the degree to which CEO engages in risk-seeking behavior to damage debt holders wealth (Edmans and Liu, 2011). Anantharaman et al. (2010) argue that if debtholders realize the incentive effects of CEO inside debt holdings, firms providing CEOs with higher relative leverage should bear a lower borrowing cost and fewer covenants. Utilizing a sample of private loans originated during 2006-2008, they find that higher CEO relative leverage is associated with lower cost of debt financing and fewer restrictive covenants. Wang et al. (2011) posit that banks demand lower yield spreads and less strict terms on loans to firms where CEOs have large inside debt holdings.

Using a sample of 1,280 loan facilities for 676 unique firms originated for the period of 2007 to 2010, they find that banks charge lower yield spreads on loans when CEOs of those firms hold larger inside debt holdings. Empirical evidence also shows that loans to firms providing CEOs with larger inside debt holdings are associated with fewer covenant restrictions. This is consistent with the view that debtholders anticipate lower expropriation risk by firms with larger CEO inside debt holdings. For instance, Chen, Dou, and Wang (2010) find that public debtholders charge lower interest rates to firms providing CEOs with more inside debt. In addition, they find that the level of CEO inside debt holdings exhibits a negative relation with restrictive debt covenants. In summary, these studies suggest that CEOs with higher inside debt compensation are associated with lower borrowing costs of debt financing and fewer restrictive covenants.